loads. Guidance on the proper determination of the value of K is given in AISC *Specification* Commentary to Appendix Section 7.2.

As indicated in the User Note in AISC *Specification* Section E2, compression member slenderness, KL/r, should preferably be limited to a maximum of 200. Note that this recommendation does not apply to members that are primarily tension members, but subject to incidental compression under other load combinations.

Additional information is available in the SSRC *Guide to Stability Design Criteria for Metal Structures* (Ziemian, 2010).

COMPOSITE COMPRESSION MEMBERS

For the design of encased composite and filled composite compression members, see AISC *Specification* Section I2. See also AISC Design Guide 6, *Load and Resistance Factor Design of W-Shapes Encased in Concrete* (Griffis, 1992). For further information on composite design and construction, see also Viest et al. (1997).

DESIGN TABLE DISCUSSION

Steel Compression—Member Selection Tables

Table 4-1. W-Shapes in Axial Compression

Available strengths in axial compression are given for W-shapes with F_y = 50 ksi (ASTM A992). The tabulated values are given for the effective length with respect to the y-axis $(KL)_y$. However, the effective length with respect to the x-axis $(KL)_x$ must also be investigated. To determine the available strength in axial compression, the table should be entered at the larger of $(KL)_y$ and $(KL)_{y\,eq}$, where

$$(KL)_{y\,eq} = \frac{(KL)_x}{\dfrac{r_x}{r_y}} \qquad (4\text{-}1)$$

"scale" your KLx so you can enter that new value into the table

Values of the ratio r_x/r_y and other properties useful in the design of W-shape compression members are listed at the bottom of Table 4-1.

Variables P_{wo}, P_{wi}, P_{wb} and P_{fb} shown in Table 4-1 can be used to determine the strength of W-shapes without stiffeners to resist concentrated forces applied normal to the face(s) of the flange(s). In these tables it is assumed that the concentrated forces act far enough away from the member ends that end effects are not considered (end effects are addressed in Chapter 9). When $P_r \le \phi R_n$ or R_n/Ω, column web stiffeners are not required. Figures 4-1, 4-2 and 4-3 illustrate the limit states and the applicable variables for each.

Web Local Yielding: The variables P_{wo} and P_{wi} can be used in the calculation of the available web local yielding strength for the column as follows:

LRFD	ASD
$\phi R_n = P_{wo} + P_{wi} l_b$ (4-2a)	$R_n/\Omega = P_{wo} + P_{wi} l_b$ (4-2b)

Table 4-1
Available Strength in Axial Compression, kips
W-Shapes

W14

F_y = 50 ksi

Shape	W14×											
lb/ft	730[h]		665[h]		605[h]		550[h]		500[h]		455[h]	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
Effective length, KL (ft), with respect to least radius of gyration, r_y	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0	6440	9670	5870	8820	5330	8010	4850	7290	4400	6610	4010	6030
11	6070	9130	5530	8310	5010	7530	4550	6840	4120	6200	3750	5640
12	6010	9030	5470	8220	4950	7440	4500	6760	4070	6120	3710	5570
13	5940	8920	5400	8110	4890	7350	4440	6670	4020	6040	3660	5500
14	5860	8810	5330	8010	4820	7250	4380	6580	3960	5950	3600	5420
15	5780	8690	5250	7890	4750	7140	4310	6480	3900	5860	3550	5330
16	5690	8560	5170	7770	4680	7030	4240	6380	3840	5770	3490	5240
17	5610	8430	5090	7650	4600	6920	4170	6270	3770	5660	3420	5150
18	5510	8290	5000	7520	4520	6790	4100	6160	3700	5560	3360	5050
19	5420	8140	4910	7380	4440	6670	4020	6040	3630	5450	3290	4950
20	5320	7990	4820	7240	4350	6540	3940	5920	3550	5340	3220	4840
22	5110	7670	4620	6950	4170	6260	3770	5660	3390	5100	3080	4620
24	4890	7340	4420	6640	3980	5980	3590	5400	3230	4860	2920	4400
26	4660	7000	4200	6320	3780	5680	3410	5120	3060	4600	2770	4160
28	4420	6650	3990	5990	3580	5380	3220	4840	2890	4340	2610	3920
30	4180	6290	3760	5660	3370	5070	3030	4560	2720	4080	2450	3680
32	3940	5930	3540	5320	3170	4760	2840	4270	2540	3820	2290	3440
34	3700	5560	3320	4990	2960	4450	2650	3990	2370	3560	2130	3200
36	3460	5200	3100	4650	2760	4140	2460	3700	2200	3300	1970	2960
38	3220	4850	2880	4330	2560	3840	2280	3430	2030	3050	1820	2730
40	2990	4500	2670	4010	2360	3550	2100	3160	1870	2800	1670	2510
42	2770	4160	2460	3690	2170	3270	1930	2900	1710	2570	1520	2290
44	2550	3830	2260	3390	1990	2990	1760	2650	1560	2340	1390	2080
46	2330	3510	2060	3100	1820	2730	1610	2420	1420	2140	1270	1910
48	2140	3220	1900	2850	1670	2510	1480	2220	1310	1960	1160	1750
50	1970	2970	1750	2630	1540	2310	1360	2050	1200	1810	1070	1610
Properties												
P_{wo}, kips	2820	4230	2410	3620	2060	3090	1750	2630	1500	2240	1280	1920
P_{wi}, kips/in.	102	154	94.3	142	86.7	130	79.3	119	73.0	110	67.3	101
P_{wb}, kips	44000	66100	34400	51700	26600	40100	20500	30800	15900	23900	12500	18800
P_{fb}, kips	4510	6780	3820	5750	3240	4870	2730	4100	2290	3450	1930	2900
L_p, ft	16.6		16.3		16.1		15.9		15.6		15.5	
L_r, ft	275		253		232		213		196		179	
A_g, in.^{2}	215		196		178		162		147		134	
I_x, in.^{4}	14300		12400		10800		9430		8210		7190	
I_y, in.^{4}	4720		4170		3680		3250		2880		2560	
r_y, in.	4.69		4.62		4.55		4.49		4.43		4.38	
r_x/r_y	1.74		1.73		1.71		1.70		1.69		1.67	
$P_{ex}(KL)^2/10^4$, k-in.^{2}	409000		355000		309000		270000		235000		206000	
$P_{ey}(KL)^2/10^4$, k-in.^{2}	135000		119000		105000		93000		82400		73300	

ASD	LRFD
$\Omega_c = 1.67$	$\phi_c = 0.90$

[h] Flange thickness is greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.